

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant:	Blees	Examiner:	Kackar, R.
Application No.:	09/759,179	Group Art Unit:	1763
Filed:	January 12, 2001	Docket No.:	NL 000044 (VLSI.415PA)
Title:	Stamp For Use In A Lithographic Process, Method Of Manufacturing A Stamp, And Method Of Manufacturing A Patterned Layer On A Substrate		

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence and the papers, as described hereinabove, are being deposited in the United States Postal Service, as first class mail, in an envelope addressed to: Board of Patent Appeals and Interferences, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450, on August 11, 2005.

By: 
Kelly S. Waltigney

REPLY BRIEF

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Sir:

This is a Reply Brief submitted pursuant to 37 C.F.R. § 41.41 for the above-referenced patent application. Appellant requests that the appeal of the instant application be maintained. If necessary, authority is given to charge/credit deposit account 50-0996 (VLSI.415PA) any fees/overages in support of this filing.

The content of this Reply Brief replicates that of the Appeal Brief filed on April 4, 2005, with the exception of this cover page and the discussion of the individual grounds of rejection in the Argument portion (Section VII) where Appellant has responded to the Examiner's arguments presented in Section 10 of the Examiner's Answer.

I. Real Party in Interest

The real party in interest is the assignee, U.S. Philips Corporation.

II. Related Appeals and Interferences

While Appellant is aware of other pending applications owned by the above-identified assignee, Appellant is unaware of any related appeals, interferences or judicial proceedings that would have a bearing on the Board's decision in the instant appeal.

III. Status of Claims

Claims 1-3, 5-7 and 11-14 are presented for appeal and each of the appealed claims, 1-3, 5-7 and 11-14, is rejected. Claims 4 and 8-10 have been canceled. The pending claims under appeal, as presently amended, may be found in the attached Appendix ofAppealed Claims.

IV. Status of Amendments

No amendments were filed subsequent to the final Office Action dated November 3, 2004.

V. Summary of Invention

The independent claims involved in the appeal are claims 1 and 6. As required by 37 C.F.R. § 41.37(c)(1)(v), a concise explanation of the subject matter defined in the independent claims involved in the appeal is provided herein. Appellant notes that representative subject matter is identified for these claims; however, the abundance of supporting subject matter in the application prohibits identifying all textual and diagrammatic references to each claimed recitation. Appellant thus submits that other application subject matter, which supports the claims but is not specifically identified below, may be found elsewhere in the application.

One example embodiment of the present invention is directed to a stamp for use in a lithographic process. *See, e.g.*, Fig. 1 and the corresponding discussion at page 10, lines 22-31. The stamp 10 has a stamp body 5 with a printing face 3 and a first recess 11 with a first aperture 15 in the printing face. The first recess becomes narrower as the distance to the printing face increases. Cross-sections of the first recess parallel to the printing face, when

projected perpendicularly on the printing face, lie within the first aperture. Also present in the stamp body is a third recess 13 with a third aperture 17 in the printing face having a depth perpendicular to the printing face that is greater than the depth of the first recess. The third recess has cross-sections parallel to the printing face and becomes substantially narrower as its distance to the printing face increases, said cross-sections, when projected perpendicularly on the printing face, lying within the third aperture. The aperture of the third recess and the aperture of the first recess each have a dimension in a first direction in the printing face. The dimension of the aperture of the third recess is at least five times the dimension of the aperture of the first recess wherein at least one of the first and third recesses has a triangular shape in a plane perpendicular to the printing face. The stamp body has a Young modulus greater than 10^6 N/m² and the stamp body further has an elastic layer disposed therein. *See* page 5, lines 26-29.

Another embodiment of the present invention is directed to a method of manufacturing a stamp for use in a lithographic process. *See, e.g.*, Figs 2a-g and the corresponding discussion at page 10, line 32 – page 11, line 13. The stamp 10 has a stamp body 5 having a surface 4 which coincides partly with the printing face 3. Anisotropic etching of a surface of a mold into a patterned mold surface (*e.g.*, Fig. 2b) creates a first recess 21 and a second recess 23 in the mold with apertures (*e.g.*, 41) in the original surface. The first recess and the second recess become narrower as the distance to the original surface increases and have cross-sections parallel to the original surface which, when projected perpendicularly on the original surface, lie within the apertures. The first and second recesses have different apertures. An unmolding agent is disposed between the mold and a first body. *See, e.g.*, page 12, lines 32-33. The method further includes making a replica of the patterned mold surface in the first body with a patterned surface, wherein the replica contains structures of different sizes. *See, e.g.*, Fig. 2d.

This summary does not provide an exhaustive or exclusive view of the present subject matter, and Appellant refers to the appended claims and their legal equivalents for a complete statement of the invention.

VI. Grounds of Rejection

A. Claims 1-2 and 5 are rejected under 35 U.S.C. § 103(a) over Whitesides *et al.* (U.S. Patent No. 5,900,160) in view of Biebuyk *et al.* (U.S. Patent No. 5,817,242) and as evidenced by Hawkins *et al.* (U.S. Patent No. 5,201,987).

B. Claim 3 is rejected under 35 U.S.C. § 103(a) over Whitesides *et al.* (U.S. Patent No. 5,900,160) in view of Biebuyk *et al.* (U.S. Patent No. 5,817,242) as evidenced by Hawkins *et al.* (U.S. Patent No. 5,201,987) and further in view of Maracas *et al.* (U.S. Patent No. 5,937,758).

C. Claims 6 and 11-13 are rejected under 35 U.S.C. § 103(a) over Whitesides *et al.* (U.S. Patent No. 5,900,160) in view of Biebuyk *et al.* (U.S. Patent No. 5,817,242).

D. Claim 7 is rejected under 35 U.S.C. § 103(a) over Whitesides *et al.* (U.S. Patent No. 5,900,160) in view of Biebuyk *et al.* (U.S. Patent No. 5,817,242) and further in view of Whitesides et al. article (“Soft Lithography” *Angew. Chem. Int. Ed.* 1998, vol. 37 pp. 551-575).

E. Claim 14 is rejected under 35 U.S.C. § 103(a) over Whitesides *et al.* (U.S. Patent No. 5,900,160) in view of Biebuyk *et al.* (U.S. Patent No. 5,817,242) and further in view of Choquette *et al.* (U.S. Patent No. 6,245,412).

VII. Argument

With respect to each of the grounds of rejection, the Examiner fails to acknowledge certain limitations of the claimed invention thereby failing to view and address the claimed invention “as a whole” as required by 35 U.S.C. § 103(a) and MPEP § 2141. In an attempt to overcome admitted deficiencies in the primary ‘160 reference, the Examiner proposes modifying the ‘160 reference in a manner that undermines and teaches away from the purpose of the ‘160 reference. Such a result is untenable. Moreover, without an assertion and presentation of correspondence to each of the claimed limitations, none of the rejections satisfy the requirements of a *prima facie* case of obviousness. Moreover, the Examiner’s rationale regarding the ‘160 reference’s combinability with various references is flawed and fails to support the various proposed modifications of the ‘160 reference. Appellant respectfully rebuts these misplaced allegations and submits that each of the Section 103(a) rejections should be reversed.

To best appreciate the deficiencies of the rejections and the primary ‘160 reference, the above-stated grounds of rejection are discussed with respect to the shorter independent claim (claim 6) first.

Regarding independent claim 6 (and claims 11-13 of Ground C above), the rejection is improper because the Examiner fails to present correspondence between the cited combination of references and each of the claimed limitations.

The Examiner fails to identify where the ‘160 reference teaches “making a replica of the patterned mold surface in the first body with a patterned surface, wherein the replica contains structures of different sizes.” *See* independent claim 6. The Examiner’s assertion that the “rejection relies on the fact that different apertures could be obtained by using mask with different size apertures” is unsupported. Moreover, while the claim may not require “larger depth for larger aperture,” it does require making a replica having “structures of different sizes,” to which the Examiner has not presented any corresponding evidence. Without a presentation of correspondence to each of the claimed limitations, the Section 103(a) rejection is improper and should not be maintained. Appellant respectfully requests that the rejection be reversed.

Dependent claims 11-12

With respect to claims 11 and 12, the Examiner also fails to identify correspondence to the limitations of at least claim 11 or claim 12. The Examiner acknowledges that the '160 reference fails to disclose an unmolding agent, as claimed, and instead relies upon Fig. 2A and column 4, lines 7-9 of the '242 reference as teaching the claimed unmolding agent. Appellant is unsure as to whether the Examiner is alleging that the '242 master substrate 20 corresponds to Appellant's mold (surface of the mold, claim 11) or Appellant's first body (surface of the first body, claim 12). As the cited portions of the '242 reference only indicate that the separating agent is applied to master substrate 20, this teaching cannot correspond to the limitations of both claims 11 and 12. Further, the Examiner's assertion that the '242 separating agent could be applied "to any of the separating surfaces" is unsupported. No teaching has been presented that would indicate that the '242 separating agent would be compatible with the materials of other "separating surfaces." The rejection still fails to present correspondence to each of the claimed limitations in both claim 6 and these dependent claims and is therefore improper. Appellant accordingly requests that the rejection be reversed.

Regarding dependent claim 7 (Ground D above), the rejection is improper because the Examiner fails to present correspondence between the cited combination of references and each of the claimed limitations.

As claim 7 also depends from independent claim 6 and the rejection of claim 7 relies upon the same primary combination of references as the rejection of claim 6, the rejection of claim 7 is insufficient for the reasons discussed above. The Examiner continues to fail to present a reference that teaches "a replica is made of the patterned surface of the first body in a second body which has a patterned surface." The Examiner makes no effort to identify correspondence in the cited references and instead merely alleges that "Since replica could be made from first body to second body or even further the method of making replica reads on the claim." Appellant notes that without a teaching of using a second body, the relied upon method fails to at least read on the claim limitations directed to "a replica is made of the patterned surface of the first body in a second body which has a patterned surface." The only teachings presented during prosecution of this application that teach "a replica is made of the patterned surface of the first body in a second body which has a patterned surface" are

Appellant's. Such a rejection based upon hindsight is improper, and without a presentation of correspondence to each of the claimed limitations in claim 6 and this dependent claim, the Section 103(a) rejection cannot be maintained. Appellant requests that the rejection be reversed.

Regarding independent claim 1 (and claims 2 and 5 of Ground A above), the rejection is improper because the Examiner fails to present evidence of motivation to combine the cited references because the primary '160 reference teaches away from the proposed combination.

The Examiner's reliance on the '987 reference as evidencing "that typically a larger aperture would result in a deeper etch compared to a smaller aperture" is merely reliance on the Examiner's flawed opinion which is based on the narrow assumption that a certain etching technique "would result in a deeper etch." This opinion is false as many etching techniques for making a larger aperture would result in a shallower etch. One example being a timed etch using the same etchant and the same material being etched but having masks with two different sized apertures. As the same amount of etchant would contact the material being etched, the material with the larger aperture would have a larger surface area being etched resulting in a shallower etch whereas the material with the smaller aperture would have less surface area to etch resulting in a deeper etch. Another example involves an anisotropic versus an isotropic etch. As the lateral and vertical etch rates differ in anisotropic etching, the lateral etch rates can be significantly faster resulting in a shallower etch compared to an isotropic (etch rates equal in all directions) etch. Moreover, because the Examiner's opinion is based on an interpretation that the '987 reference teaches a certain etching result, for the Examiner's opinion to be supported, the corresponding etching technique that created the result would also have to be relied upon. Were one of the other (above discussed) techniques used, the Examiner's opinion would be contradicted. Accordingly, the Examiner is incorrect in arguing that he does not need to present evidence in support of combining the '987 etching technique with the cited combination of references.

Thus, the Examiner continues to fail to provide evidence from any of the cited references for combining the relied upon references as asserted. Without a presentation of evidence from the cited references that the skilled artisan would be led to modify the cited references as proposed, the rejection is improper and should be reversed.

Regarding dependent claim 3 (Ground B), the rejection is improper because the Examiner fails to present evidence of motivation to combine the cited references.

The rejection of dependent claim 3 is improper for the reasons discussed above in connection with independent claim 1 and because the Examiner fails to present any evidence that the cited ‘160 teachings, as modified, could be further modified to include sub-micron feature sizes. The ‘160 teachings acknowledge the resulting deformation of a stamp created and used in accordance with the reference’s teachings. This deformation prevents spacing of apertures within one micron as the deformation would destroy such spacing. *See* Figs. 3a-c and Col. 10, lines 6-15. A skilled artisan would not be motivated to modify the ‘160 teachings to create an inoperable embodiment, *e.g.*, the destruction of the spacing due to deformation would render the stamp inoperable. The Examiner’s assertion that “sub micron feature size is obtained by design and not by using the stamp at high compressive force thereby to deform the stamp” is not relevant to the issue of motivation. The Examiner has not presented any evidence from the cited references in support of the proposed modification. Thus, the rejection of dependent claim 3 under 35 U.S.C. § 103 should be reversed.

Regarding claim 14 (Ground E), the rejection is improper because the Examiner fails to present correspondence between the cited combination of references and each of the claimed limitations.

As the Examiner did not address this ground of rejection in the Examiner’s Answer, Appellant does not present any response.

VIII. Conclusion

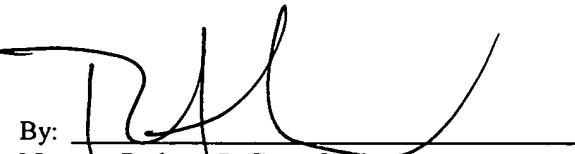
In view of the above, Appellant submits that the rejections are improper, the claimed invention is patentable, and that the rejections of claims 1-3, 5-7 and 11-14 should be reversed. Appellant respectfully requests reversal of the rejections as applied to the appealed claims and allowance of the entire application.

Authority to charge the undersigned's deposit account was provided on the first page of this brief.

Should there be any issues that could be readily addressed over the telephone, the Examiner is asked to contact the agent overseeing the application file, Mr. Peter Zawilski, of Philips Corporation at (408) 474-9063.

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APPENDIX OF APPEALED CLAIMS

1. A stamp for use in a lithographic process, which stamp comprises a stamp body with a printing face, said stamp body having a first recess with an first aperture in the printing face, wherein

the first recess becomes narrower as its distance to the printing face increases, and cross-sections of the first recess parallel to the printing face, when projected perpendicularly on the printing face, lie within the first aperture, and a third recess with an third aperture in the printing face and a depth perpendicular to the printing face that is greater than the depth of the first recess is present in the stamp body,

which third recess has cross-sections parallel to the printing face and becomes substantially narrower as its distance to the printing face increases, said cross-sections, when projected perpendicularly on the printing face, lying within the third aperture,

the aperture of the third recess and the aperture of the first recess each have a dimension in a first direction in the printing face, and

said dimension of the aperture of the third recess is at least five times the dimension of said aperture of the first recess, wherein at least one of the first and third recesses has a triangular shape in a plane perpendicular to the printing face;

wherein the stamp body has a Young modulus greater than 10^6 N/m², and the stamp body further has an elastic layer disposed therein.

2. A stamp as claimed in claim 1, characterized in that the first recess has a triangular shape in a first plane perpendicular to the printing face.

3. A stamp as claimed in Claim 1, characterized in that

a second recess with an second aperture in the printing face is present in the stamp body,

which second recess has cross-sections parallel to the printing face and becomes narrower as its distance to the printing face increases, said cross-sections, when projected perpendicularly on the printing face, lie within the second aperture, and

said second aperture is present at a distance smaller than 1 μm from the aperture of the first recess.

5. A stamp as claimed in claim 1, characterized in that said dimension of the aperture of the third recess is at least twenty times said dimension of the aperture of the first recess.

6. A method of manufacturing a stamp for use in a lithographic process, which stamp has a stamp body with a surface which coincides partly with the printing face, comprising the steps of:

 anisotropic etching of a surface of a mold into a patterned mold surface, such that a first recess and a second recess are created in the mold with apertures in the original surface, which first recess and a second recess become narrower as its distance to the original surface increases and has cross-sections parallel to the original surface which, when projected perpendicularly on the original surface, lie within the aperture, and wherein the first and second recesses have different apertures;

 disposing an unmolding agent between the mold and a first body; and

 making a replica of the patterned mold surface in the first body with a patterned surface, wherein the replica contains structures of different sizes.

7. A method as claimed in claim 6, characterized in that a replica is made of the patterned surface of the first body in a second body which has a patterned surface.

11. The method of claim 6, wherein the unmolding agent is disposed on a surface of the mold.

12. The method of Claim 6, wherein the unmolding agent is disposed on a surface of the first body.

13. The method of Claim 6, wherein the unmolding agent comprises fluorosilane.

14. The method of Claim 13, wherein disposing the unmolding agent comprises vacuum deposition.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.